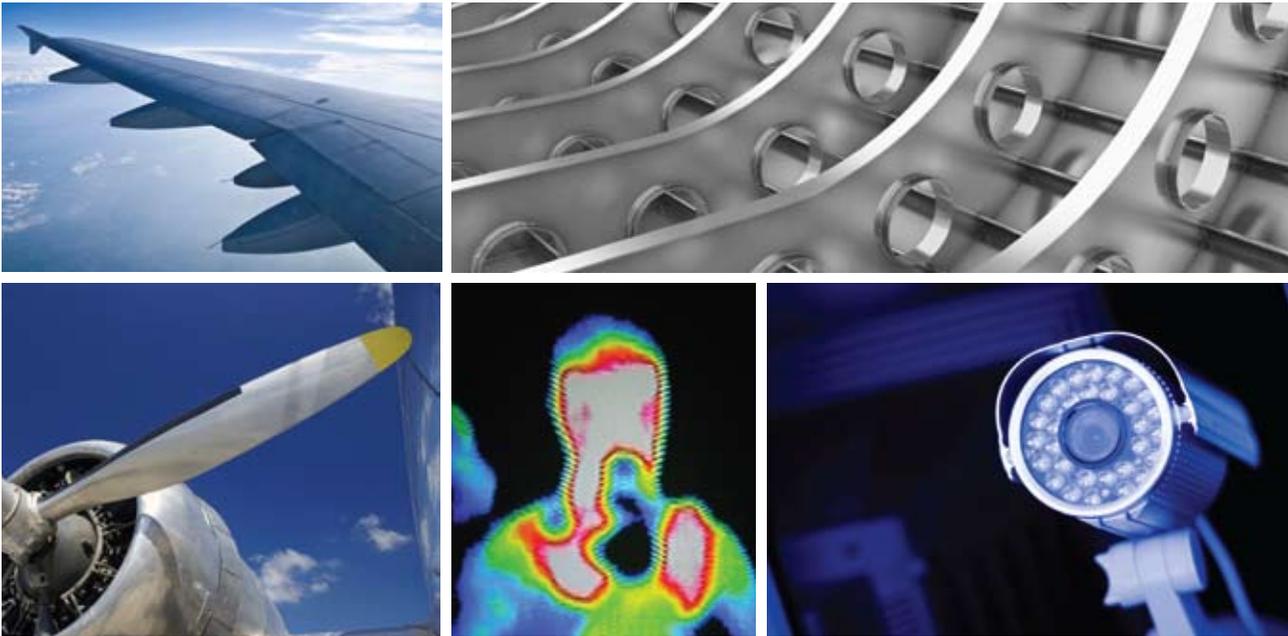




technology opportunity

# Flash Infrared Thermography Software

*Computer simulation and data analysis software for nondestructive testing and evaluation of composite and metallic materials*



Researchers at NASA's Johnson Space Center (JSC) have developed an effective, cost-efficient, infrared (IR) flash thermography software program capable of detecting anomalies, such as voids, cracks, and delamination, in composite and metallic structures. Using an innovative IR contrast methodology, this software accurately measures flaw depth, width, and diameter. The software has applications in aerospace, as well as nondestructive testing and evaluation, IR camera manufacturing, and IR thermography analysis.

## Benefits

- **Precise:** Provides detailed characterization of flaw shape, size, depth, and location
- **Robust:** Provides objective, repeatable, numerical measurements of subsurface anomalies
- **Camera and operator independent:** Normalizes data which reduces errors due to operator and equipment variability
- **Versatile:** Can be used to analyze composite or metallic materials and flat or curved surfaces
- **Cost-efficient:** Can be incorporated easily and inexpensively into existing equipment

## Applications

- Nondestructive testing and evaluation of materials and surfaces in the following areas:
  - Aerospace (e.g., aircraft wings, propeller blades)
  - Power generation (e.g., turbine blades, pipelines)
  - Manufacturing (e.g., welds, adhesive joints, semiconductors)
  - Chemical and petrochemical industries
- IR camera manufacturers
- Software developers

## Technology Details

JSC's flash IR thermal data analysis software identifies and evaluates delamination-like defects in materials and components.

### **How it Works**

Originally developed as a nondestructive evaluation technique for the space shuttle, this innovation analyzes raw IR thermography data to detect anomalies, such as voids, cracks, or delamination, in both composite and metallic materials. In IR thermography applications, a pulse of infrared light is directed onto a material and the reflected thermal response of the material generates an infrared image. If a defect is present in the subsurface of the material, heat flowing at the structure's front surface will be impeded relative to the surrounding, defect-free regions. Variations in the thermal diffusivity of the material manifest themselves as anomalies in the thermal image of the test surface. This innovative flash IR thermography analysis uses the evolution of measured pixel intensity over time, and compares it with a calibrated empirical simulation, to evaluate anomaly depth and size.

### **Why it is Better**

Critical components in aerospace structures, although optimized for performance, can be difficult, if not impossible, to inspect adequately due to the complexity of structural design and/or the use of advanced materials. This computer simulation and data analysis software offers a robust, repeatable, objective measurement of subsurface defects. It is capable of analyzing composite or metallic materials and flat or curved surfaces. Currently available commercial thermography software does not distinguish between image contrast and temperature contrast and therefore provides less accurate characterization of defects. Furthermore, because this software normalizes data, it provides more stable measurements and greatly minimizes errors due to operator variability.

### **Patents**

Johnson Space Center is currently seeking patent protection for this technology.

## Licensing and Partnering Opportunities

This technology is part of NASA's Innovative Partnerships Program, which seeks to transfer technology into and out of NASA to benefit the space program and U.S. industry. NASA invites companies to consider licensing the Flash IR Thermography Contrast Computer Simulation and Data Analysis Software (MSC-24444-1 and MSC-24506-1) for commercial applications.

### **For More Information**

If you would like more information or want to pursue transfer of this technology please contact us at:

**Advanced Planning Office**  
**NASA's Johnson Space Center**  
**Phone: 281-483-3809**  
**Email: [jsc-techtran@mail.nasa.gov](mailto:jsc-techtran@mail.nasa.gov)**  
**<http://technology.jsc.nasa.gov>**